ATS/CIRA Colloquium

Dr. William Gray

Deep Ocean Circulation Changes as the Primary Driver for Global Climate Change

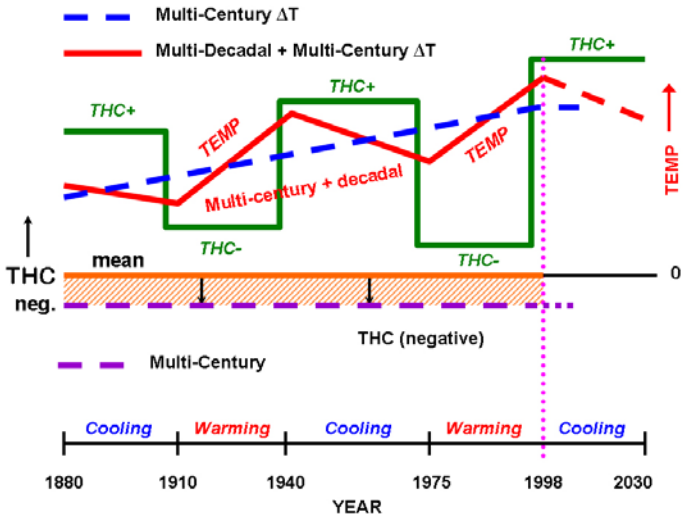
Thursday, August 30, 2012

ATS room 101; Discussion will begin at 3:30pm
Refreshments will be served at 3:00pm in the coffee lounge

An important process with regards to climate change is the prevalence of multi-decadal periods of fluctuations in both global and local temperature, precipitation, and other climate elements. The usual period of these variations is about 50-70 years or roughly 25-35 years between low to high or high to low periods. The weather 25-35 years ago can often seem different from what we experience today. Such multi-decadal periods have always been part of the earth's climate system. Such changes have been well documented backward in time for thousands of years in paleo-climate data sets of various types. For example, global cooling periods were experienced between 1880-1910, 1945-1975 and the slight global cooling that has been experienced since 1998. Periods of distinct global surface warming occurred between 1910-1940 and 1975-1998.

These changes in climate are hypothesized to be due to the natural back-and-forth swings of the globe's deep ocean circulation patterns which are primarily driven by upper-ocean salinity differences. These salinity changes are caused by precipitation and evaporation differences on different time and space scales and have no direct association with radiation changes.

Surface temperature measurements over the last 130 years have also indicated a weaker and longer multi-century period of upward mean global warming trend upon which the shorter and stronger up-and-down multi-decadal warming and cooling periods are superimposed. This longer and weaker multi-century global warming since the 19th century is also hypothesized to result from the multi-century slow-down of the global ocean's Meridional Overturning Circulation (MOC) of which the Atlantic Ocean Thermohaline Circulation (THC) plays a major part along with the deep water subsidence surrounding the Antarctic continent. Variations in deep water formation in both of these areas is brought about by upper-ocean salinity variations. This long-period global surface temperature rise is hypothesized to result from the globe's climate slowly recovering from the Little Ice-Age period when the MOC was in a stronger mode.



Link to colloquium videos and announcement page: http://www.atmos.colostate.edu/dept/colloquia.php